Review for Ramírez et al. (MS No.: egusphere-2024-847)

The paper "OAE does not cause cellular stress in a phytoplankton community of the subtropical Atlantic Ocean" by Ramírez et al. presents valuable and intriguing data on the phytoplankton community, along with the physiological effects of OAE treatment observed during a mesocosm experiment. While the dataset is substantial and noteworthy, the presentation and condensation of the information could be improved to enhance clarity. Restructuring both the results and discussion sections would help emphasize the main message the authors aim to convey.

Main Comments

1) I understand that mesocosm experiments generate extensive data, often published in various sources. However, this paper would benefit from including more comprehensive background information to elucidate the ongoing processes, such as variations in nutrient levels and pH. Specifically, the paper should address how nutrient limitations, which impact cell numbers and cellular fitness, can be disentangled from the effects of increased alkalinity. Providing this context would significantly enhance the reader's ability to grasp the complex interactions at play.
2) I recommend a better differentiation between community data and physiological fitness. A lot of different methods are mentioned (HPLC, Microscopy, Metaproteome data), but not all of the data is shown or discussed later. For example, the authors often refer to size classes (nano-, picoplankton), but the method say that HPLC data as well as microscopic data is available. Why this is not used later to state the different taxonomic groups? See also comment for L 556.
3) Please include more recent publications in the discussion (see especially this special issue of Biogeosciences:https://bg.copernicus.org/articles/special_issue1246.html)

Abstract

Comment 1

Please indicate in the abstract which OAE treatment was used. This is important as there are other alkalinity enhancement studies using different alkaline materials.

Comment 2

Graphical abstracts should be self-explanatory and abbreviations shown should be known to the research community or mentioned in the abstract, what does "Ci" stand for.

Introduction

Comment 3

Overall, the introduction gives a good background to the research field of OAE. However, I miss a better introduction to the pigments measured (section 2.2; VAZ, DD-DT. DD, DT) and it's importance to understand processes possibly impacted by the OAE treatments. What was the hypothesis for the study? What did the authors expect with increased Alkalinity?

Results

Comment 4

In the Results section, it is not clear to me why 3.1 "Community composition" and 3.2 "Total phytoplankton community response" are two separate paragraphs. The results section should be more condensed.

Discussion

Comment 5

L463: This sentence does not contribute to the understanding of the phytoplankton and physiological data if it is not placed in context or shown in the results/discussion. Either delete this sentence or use the environmental data to explain your data.

Comment 6

L475: the authors state, that “heterotrophic” processes influence the fitness? Can they rule out nutrients?

Comment 7

L493: “Certainly there was nutrient limitation…”When? Is this driving the decline in phase 1? It is hard to follow the statement, if the nutrient data was never shown (see also main comment above)

Comment 8

L501: The DIC data of the experiment is available, why not directly compare with it.

Comment 9

L556 "Phytoplankton flourished during Phase II...", Which groups? Coccolithophores, dinoflagellates, diatoms? Are there winners and losers among these groups during the different alkalinity treatments?

Minor comments:

L30 space between “pronounced” and “community”
L51 Please rephrase the sentence. The most likely scenarios are RCP 4.5 or 6. RCP8.5, often referred to as the "worst-case" or "business as usual" scenario, is considered less likely because it assumes very high emissions with no or very minimal climate policies.
L80 Please modify the sentence, it is hard to read, e.g.: “OAE can be achieved through the weathering of alkaline minerals, like limestone or silicate minerals….. olivine.
L91: correct “species”, shouldn’t be italic font
L92: the last “I” in watsonii should be italic.
L131: sentence structure: “…set of variables presented here…”
L140: please state the real TA values in seawater as well.
L143: Not sure, why here OAE is abbreviated? Not necessary.
L202: sentence“…was firstly was…”
L289: Sentence structure
L299: delete “below”
L311: Parts of this paragraph should be already mentioned in the introduction.
L441: “The ratios DT+DD… can be used as proxies of the cellular physiological status of the cells…”. What exactly does a high or low ratio mean? Does a high ration mean a lot of stress? Please explain this in the text and possibly also in the figure and or figure caption.

L502: This is the first time, this abbreviation is introduced, too late given that it is even in the graphical abstract. Please introduce earlier. Suggestion: Use $C_{inorg.}$ Or something similar.
L514: Sentence structure: “Another possible…”
L573: “ total change of 20% in the proteome”…a decrease?

Figure/Tables

Figure 1: It is hard to compare the data, if all plots have a different scale. In plot E) and F) you could add an axis break. Consider to add a mark for the different phases.

Figure 2a: Same as in Fig. 1, consider to indicate the different phases of the experiment. Move the legend to the right side of the plot.

Figure 2b,c,d,e: Please increase the font size of the x and y axes.

Table 1: Please check the Photophysiology box, it shows two squares. Not sure, if this is intended.

Figure 3a: The labels are a bit blurry which makes it difficult to read. Maybe you can improve the figure.

Figure 4,5: What are the grey and red filled squares? Not explained in the figure caption

Figure 6: The different symbols in the legend below are not necessary, only display the colors of the Alkalinity treatments.